DOCUMENT RESUME

ED 419 179 CG 028 409

AUTHOR Chmielewski, Todd L.; Moreland, Jeremy L.; Dansereau, Donald F.

TITLE Integrating New Information into Prior Knowledge.

PUB DATE 1997-08-00

NOTE 11p.; Paper presented at the Annual Convention of the American Psychological Association (105th, Chicago, IL, August 15-19, 1997).

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS Cognitive Mapping; *Cognitive Structures; College Students; Concept Formation; Higher Education; Information Management; *Learning Processes; *Prior Learning

IDENTIFIERS *Knowledge Maps

ABSTRACT

Because knowledge is constantly in flux, it is important for individuals to accurately incorporate new information into previously developed knowledge structures. Some of the issues surrounding this development of thought are explored in this paper. Although the phenomenon of knowledge integration is relatively common, very little empirical research has been devoted to the topic. The general objective of this study is to examine some of the components involved in the integration of knowledge. Participants for the study were 68 students recruited from undergraduate psychology courses. The students initially learned a body of material formatted as either a knowledge map or as a standard text. After studying this initial information, they were presented with new information that either supported or contradicted what they had previously learned (without having the original materials available). The ... indicate that knowledge maps are more effective than text for facilitating the integration of knowledge. (MKA)

Integrating New Information Into Prior Knowledge

Todd L. Chmielewski

Jeremy L. Moreland

Donald F. Dansereau

Texas Christian University

Correspondence:

Todd L. Chmielewski
Texas Christian University
Department of Psychology
TCU BOX 298920
Fort Worth, Texas 76129
phone: (817)921-7410
fax: (817)921-7681
email: t.chmielewski@tcu.edu

Presented at the 105th annual convention of the American Psychological Association

Abstract

Although the phenomenon of knowledge integration is relatively common, very little empirical research has been devoted to this topic. The general objective of the current study was to examine some of the components involved in this process. Participants initially learned a body of material formatted as either a knowledge map or standard text. After studying the initial information, participants were presented with new information that either supported or contradicted what they had previously learned (without having the original materials available). Results indicated that knowledge maps were more effective than text for facilitating the integration of knowledge.

Integrating New Information Into Prior Knowledge

Because knowledge is constantly in flux, it is important for individuals to accurately incorporate new information into previously developed knowledge structures. Prior research on this process has been primarily limited to the revision of word lists (e.g., Bjork, 1978; Tulving, 1966), although there have been a few exceptions (see Wilkes & Leatherbarrow, 1988). One important finding from these studies was that integrating knowledge (or updating), in some cases, is more difficult than learning new information (Tulving, 1966). Although prior research has suggested principles involved in the integration process (cf. Anderson, 1981), its relevance for larger and more complex bodies of information appear to be limited.

The present study extends this research by examining the effect of different original information formats on the recall of subsequently incorporated information. Two presentation formats were utilized in the current study. The first, knowledge map (see Figure 1), is a semantic node-link display that represents key concepts and ideas (nodes) and the relationships (links) these concepts share (Evans & Dansereau, 1991; Lambiotte, Dansereau, Cross, & Reynolds, 1989). The second format was informationally-isomorphic text. A second factor that may have a major impact on the integration process is the type of information that is being integrated into an existing knowledge structure (Larsen, 1982), or more specifically, the relationship between the new and old information. If new information has enough relevance to warrant its integration into existing knowledge, then the new information must somehow support or contradict existing knowledge structures. Supportive information is information that

substantiates, confirms, or elaborates existing knowledge. In contrast, contradictory information is information that replaces or corrects existing knowledge. The impact of these two types of information on integration was examined.

METHOD

Participants

Sixty-eight students recruited from undergraduate psychology courses received experimental credit for their participation.

Materials

A knowledge map was constructed containing information on the life and scientific contributions of Albert Einstein (60 nodes/59 links). An informationally isomorphic text (538 words) was also constructed. Participants were also given an update list containing nine sentences that supported the original information and nine contradictory sentences.

Procedure

All participants were trained on how to read and utilize knowledge maps. Next, participants were randomly assigned to one of two experimental groups. They were given 15 minutes to read and study the Einstein map or text. Immediately after studying participants completed a free recall test and the Delta Reading Vocabulary Test (Deignan, 1973). Participants were then given a list of 18 sentences and told to implicitly incorporate this information into what they had previously studied (the original materials were not available). Forty-eight hours later participants completed another free recall test.

RESULTS

A t-test was conducted on the first of the two free recall tests in order to determine any differences between the map and text groups that may have been attributed to initial learning. The means for the map and text groups were 114.64 and 108.89 respectively; they were not significantly different ($t<1$).

A one-way MANCOVA was conducted on the second free recall test with unupdated, supportive-new, and contradictory-new information serving as the dependent variables and with the Delta serving as the covariate. Means and standard deviations are presented in Table 1. There was a significant multivariate effect, $F(3, 63) = 6.57$, $p < .05$. There were significant univariate effects for all three types of information, [unupdated information, $F(1,65) = 16.47$, $p < .05$; supportive information, $F(1,65) = 5.26$, $p < .05$; and contradictory, $F(1,65) = 4.05$, $p < .05$] indicating participants who studied maps outperformed those using text.

DISCUSSION

The fact that knowledge maps enhanced delayed recall for the unupdated information was not surprising, considering prior research showing the superiority of maps (i.e., Holley & Dansereau, 1984). The fact that recall for the unupdated information was better after 48 hours when retrieval conditions would be more difficult, suggests that maps enhance retrievability of the information rather than initial encoding (see Lambiotte et al., 1989).

However, the more important question is, "why did participants utilizing maps outperform those utilizing text for the new information when the presentation format was

the same for both groups (i.e., list of sentences)?" One possible explanation is that by studying maps initially, participants may have been able to integrate the new information more effectively than those who studied text. A second possibility is that both groups integrated the information equally, but access to important parts of the information were lost over time for those working with text. In any case, the current investigation suggests that knowledge maps are effective tools for facilitating the integration of knowledge.

References

Anderson, J. R. (1981). Effects of prior knowledge on memory for new information. *Memory and Cognition, 9,* 237-246.

Bjork, R. A. (1978). The updating of human memory. In G. H. Bower (Ed.), *The psychology of learning and motivation* (pp.235-259). New York: Academic Press.

Chmielewski, T. L., Dansereau, D. F., & Moreland, J. L. (1996). *Updating knowledge: The roles of format, editing, and information type.* Manuscript submitted for publication.

Deignan, G. M. (1973). *The Delta Reading Vocabulary Test.* Air Force Human Resources Laboratory, Lowry Air Force Base, CO.

Evans, S. H. & Dansereau, D. F. (1991). Knowledge maps as tools for thinking and communication. In R.F. Mulcahy, R.H. Short, & J. Andrews (Eds.), *Enhancing learning and thinking* (pp. 97-120). New York: Praeger.

Holley, C. D. & Dansereau, D. F. (1984). Networking: The technique and the empirical evidence. In C. D. Holley & D. F. Dansereau (Eds.), *Spatial learning strategies: Techniques, applications, and related issues*, (pp. 81-108). Orlando, FL: Academic Press.

Lambiotte, J. G., Dansereau, D. F., Cross, D. R., & Reynolds, S. B. (1989). Multirelational semantic maps. *Educational Psychology Review, 1,* 331-367.

Larsen, S. F. (1982) Knowledge updating in text processing. In A. Flammer and W. Kintsch (Eds.), *Discourse processing.* Amsterdam: North Holland.

Tulving, E. (1966). Subjective organization and effects of repetition in multi-trial free-recall learning. *Journal of Verbal Learning and Verbal Behavior, 5,* 193-197.

Wilkes, A. L., & Leatherbarrow, M. (1988). Editing episodic memory following the identification of error. *The Quarterly Journal of Experimental Psychology, 40A*, 361-387.

Table 1

Observed and Adjusted (Delta) Means and

Observed Standard Deviations for Free Recall 2 Measures

Group and Information Type	Observed Mean	Standard Deviation	Adjusted Mean
Map			
Unupdated	76.39	30.92	76.34
Supportive	8.92	5.85	8.91
Contradictory	13.31	7.05	13.30
Text			
Unupdated	52.78	27.61	52.83
Supportive	6.03	4.93	6.04
Contradictory	10.25	6.21	10.25

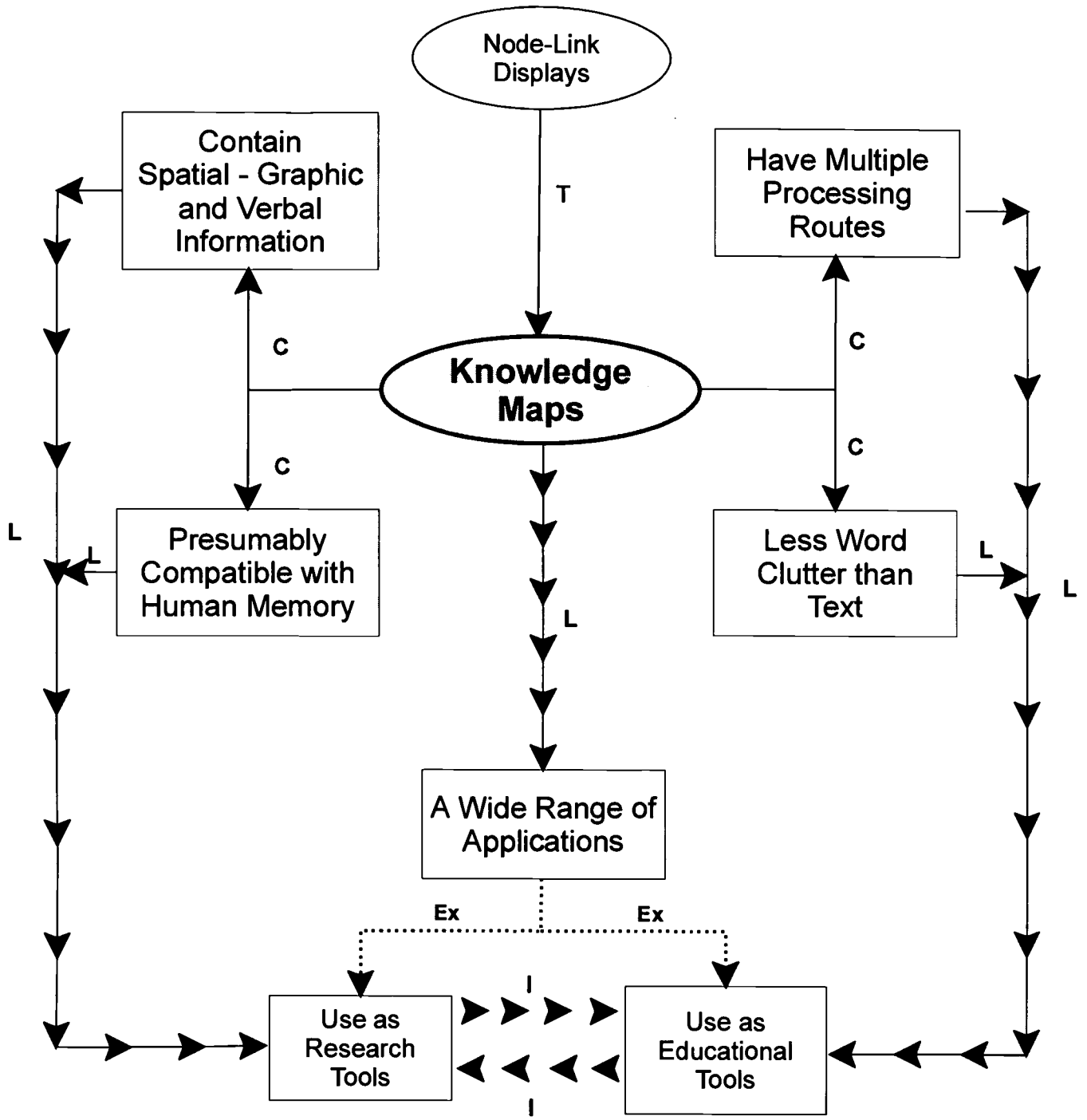

Figure 1. An example of a knowledge map.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Integrating New Information Into Prior Knowledge

Author(s): Todd L. Chmielewski, Jeremy Moreland, Donald F. Dansereau

Corporate Source: Texas Christian University

Publication Date: August, 1997 (APA)

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following two options and sign at the bottom of the page.

☒ Check here
For Level 1 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical) *and* paper copy.

The sample sticker shown below will be affixed to all **Level 1** documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 1

The sample sticker shown below will be affixed to all **Level 2** documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 2

☐ Check here
For Level 2 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical), but ***not*** in paper copy.

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at **Level 1.**

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Sign here→ please

Signature: Todd L. Chmielewski

Printed Name/Position/Title: TODD L. Chmielewski / Graduate Student

Organization/Address: TCU BOX 298920, Department of Psychology, Fort Worth, TX 76109

Telephone: (817) 921-7410

FAX: (817) 257-7681

E-Mail Address: t.chmielewski@tcu.edu

Date: 12/16/97

ERIC CASS

COUNSELING AND STUDENT SERVICES CLEARINGHOUSE

Dear 1997 APA Presenter:

The ERIC Clearinghouse on Counseling and Student Services invites you to contribute to the ERIC database by providing us with a written copy of the presentation you made at the American Psychological Association's 105th Annual Convention in Chicago August 15-19, 1997. Papers presented at professional conferences represent a significant source of educational material for the ERIC system. We don't charge a fee for adding a document to the ERIC database, and authors keep the copyrights.

As you may know, ERIC is the largest and most searched education database in the world. Documents accepted by ERIC appear in the abstract journal Resources in Education (RIE) and are announced to several thousand organizations. The inclusion of your work makes it readily available to other researchers, counselors, and educators; provides a permanent archive; and enhances the quality of RIE. Your contribution will be accessible through the printed and electronic versions of RIE, through microfiche collections that are housed at libraries around the country and the world, and through the ERIC Document Reproduction Service (EDRS). By contributing your document to the ERIC system, you participate in building an international resource for educational information. In addition, your paper may listed for publication credit on your academic vita.

To submit your document to ERIC/CASS for review and possible inclusion in the ERIC database, please send the following to the address on this letterhead:

(1) Two (2) laser print copies of the paper,
(2) A signed reproduction release form (see back of letter), and
(3) A 200-word abstract (optional)

Documents are reviewed for contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality. Previously published materials in copyrighted journals or books are not usually accepted because of Copyright Law, but authors may later publish documents which have been acquired by ERIC. However, should you wish to publish your document with a scholarly journal in the future, please contact the appropriate journal editor prior to submitting your document to ERIC. It is possible that some editors will consider even a microfiche copy of your work as "published" and thus will not accept your submission. In the case of "draft" versions, or preliminary research in your area of expertise, it would be prudent to inquire as to what extent the percentage of duplication will effect future publication of your work. Finally, please feel free to copy the reproduction release for future or additional submissions.

Sincerely,

Jillian Barr Joncas

Jillian Barr Joncas
Assistant Director for Acquisitions and Outreach

School of Education
201 Ferguson Building P.O. Box 26171
University of North Carolina at Greensboro
Greensboro, NC 27402-6171
800/414.9769
910/334.4114
FAX: 910/334.4116
mail: ericcas2@dewey.uncg.edu

ERIC